

# **MARK-IV VHF BROADBAND SIGNAL BOOSTER M4BBDAV**

## **OPERATIONS & MAINTENANCE (O&M) MANUAL**

**REVISION 0  
SUBMITTED BY:**

**CANAM TECHNOLOGY, INC.**

**April, 2015**



## Part 90 Signal Boosters THIS IS A 90.219 CLASS B DEVICE

**WARNING.** This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at [www.fcc.gov/signal-boosters/registration](http://www.fcc.gov/signal-boosters/registration). Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation."

## TABLE OF CONTENTS

Section A.	INTRODUCTION.....	6
Section B.	GLOSSARY .....	8
Section C.	SAFETY PRECAUTIONS .....	9
C.1	EQUIPMENT HANDLING AND INSTALLATION .....	9
C.2	POWER SUPPLIES .....	9
C.3	MCPA MODULES .....	9
C.4	RF EXPOSURE.....	9
C.5	MOVING PARTS .....	10
Section D.	THEORY OF OPERATION .....	11
D.1	DESCRIPTION .....	11
D.2	FUNCTIONAL BLOCK DIAGRAM .....	12
D.3	FEATURES.....	13
D.4	SPECIFICATIONS.....	14
D.5	FRONT AND REAR PANEL PORTS AND INTERFACES.....	17
D.6	LCD-DISPLAY & KEYPAD ASSEMBLY .....	19
Section E.	INITIAL CONFIGURATION .....	22
E.1	GENERAL GUIDELINES REGARDING RF CONNECTIONS & OPERATIONS WITH TEST INSTRUMENTS .....	23
E.2	ANTENNA INSTALLATION.....	24
Section F.	WEB-SERVER GRAPHICAL USER INTERFACE .....	25
F.1	FIRST-TIME START CONFIGURATION .....	25
F.1.1	CONNECTING SYSTEM DIRECTLY TO PC COMPUTER .....	25
F.1.2	CONNECTING SYSTEM TO LOCAL AREA NETWORK .....	28
F.2	WEB SERVER OPERATIONS .....	30
F.2.1	MAIN STATUS PAGE.....	31
F.2.2	MAIN SETTINGS PAGE .....	35
F.2.2.1	iALC Control.....	35
F.2.2.2	MCPA Control:.....	36
F.2.2.3	Updating operational settings .....	37



**TABLES**

Table 1 – Front Panel details ..... 17

Table 2 – Rear Panel details. .... 18

Table 3 – Alarm available at the Front Panel LCD .....20

Table 4 – Meters available at the Front Panel LCD.....21

Table 5 – Network Settings available at the Front Panel LCD.....21



## **TABLE OF FIGURES**

Figure 1 – M4BBDAV General Block Diagram .....	12
Figure 2 - Front Panel details .....	17
Figure 3 - Rear Panel details.....	18
Figure 4 – LCD and Keypad Interface .....	19
Figure 5 – System connected directly to PC computer.....	25
Figure 6 – Local Area Connection Status. ....	26
Figure 7 – Local Area Connection Properties. ....	27
Figure 8 – System connected into local area network. ....	28
Figure 9 – Main Status page .....	31
Figure 10 – Main Settings page.....	35
Figure 11 – Value is not into valid range error message .....	38



## Section A. INTRODUCTION

The MARK-IV VHF Broadband Signal Booster (M4BBDAV) is a Class “B” Industrial Signal Booster for FCC Part 90 PLMRS Public Safety Agencies used to operate within range 150-174 MHz for Land Mobile Radio.

This document is the M4BBDAV Operations and Maintenance Manual, intended for the Radio Technical Personnel.

This manual is intended to be used with the M4BBDAV Equipment only. It is not to be used with any other equipment unless it is authorized by Canam Technology, Inc.



Canam Technology, Inc. provide this document “as is” without any warranty of any kind. Canam Technology may make changes to the equipment, software or specifications in this document at any time without notice to the user. These changes will be notified to the party responsible for FCC compliance and they will be incorporated in future releases of this document.

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This document may contain typographical errors and technical inaccuracies. Canam Technology will not accept any liability from the use and misuse of this manual, the information contained within, or the consequences of any actions resulting from the use of this information.



Signal boosters such as the M4BBDAV generate radio signals and, therefore, electromagnetic fields. The technical personnel should have a complete understanding of FCC CFR Title 47 sections 1.1307 and 1.1310. Recommendations are included in this Manual, but they do not substitute the FCC guidelines.

#### M4BBDAV Key Features:

- Broadband Class B Signal Booster, per FCC Part 90.
- Maximum Output Power at the antenna port +37 dBm per carrier.



This device may require the use of antennas for proper functioning, depending on the application. The installation of the antennas should be performed by qualified technical personnel. All antennas should be fixed mounted and physically secured to one location **The people must be away from the antennas at least 1.0 meters to comply with the RF Human Maximum Permissible Exposure limits, as long as the antenna system gain is lower than 7 dBi.** If greater gain is used the separation should be increased, please refer to the FCC Rules.



If service should be performed on the antenna, please shut down the transmitter or lower its power in order to comply with the maximum permissible exposure.



## Section B. GLOSSARY

- AC: Alternate Current.
- AGC: Automatic Gain Control, typically used on narrowband channel filters.
- DL: Downlink. Transmission link from the base station to the mobile station.
- DSP: Digital Signal Processing/Processor
- ECM: Embedded Control Module (also named as M4-ECM)
- GUI: Graphical User Interface
- iALC: Input Automatic Level Control (Input broadband limiter).
- MCPA: Multi-Carrier High-Power Amplifier
- PSU: Power Supply Unit
- Relay: Electromechanical switch. The system uses Form-C (SPDT) relays for external alarms
  - COM: Common contact or port
  - NC: Normally-Closed contact or port
  - NO: Normally-Open contact or port
- RF: Radio Frequency
- Rx: Receiver
- SNMP: Simple Network Management Protocol.
- Tx: Transmitter
- UL: Uplink. Transmission link from the mobile station to the base station.



## Section C. SAFETY PRECAUTIONS

Ensure that All Operating and Maintenance Personnel do follow INDUSTRY standard Safety Methods and Precautions. There are system-specific precautions that must be enforced, such as:

- Site Safety Policies
- Equipment Handling and Installation
- AC power feeds and Power Supply Converters
- Multi-Carrier (High) Power Amplifier (MCPA) modules hot surfaces
- RF Exposure

### C.1 EQUIPMENT HANDLING AND INSTALLATION

1. The enclosure has a weight of 30 kg approximately.

### C.2 POWER SUPPLIES

1. When servicing the internal Power Supply and wiring unit, be aware that power lines are in screw terminal blocks.
2. **CAUTION:** Removal and Installation requires that the main power switch be in the OFF position, and the power cord be disconnected from the enclosure.

### C.3 MCPA MODULES

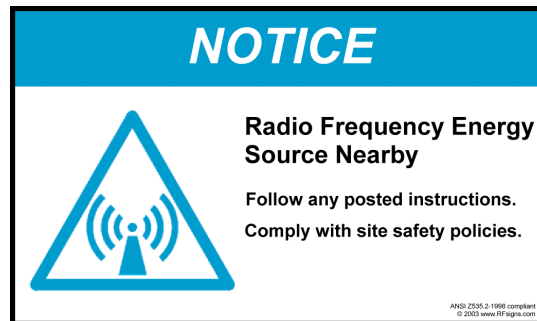
1. Internal MCPA modules are mounted to their corresponding heat sinks and are used to dissipate DC power. Both the Heat Sink and the MCPA module **MAY** be hot.

### C.4 RF EXPOSURE

The RF Field Strengths that an individual will be exposed to while doing maintenance is well below the limits set forth by the FCC & State Laws.

Nevertheless, there are Safety Precautions that should be adhered when performing any RF Tests:

1. Never Operate a Transmitter, or Booster Amplifier without adequate Load/Termination on the Output Port.
2. Ensure all Connections are tight and secured.
3. Ensure all Coaxial Cable Insulation covers the Outer Shield of the cable.
4. Do Not Touch Exposed System Ports or Coaxial Cable if system is Transmitting.



## C.5 MOVING PARTS

1. The system has moving parts as fans.
2. Keep your hands and tools away from moving parts.
3. When servicing and wiring unit, be aware main power switch be in the OFF position and all moving parts are stopped.

## Section D. THEORY OF OPERATION

### D.1 DESCRIPTION

The MARK-IV VHF Broadband Signal Booster (M4BBDAV) is a stand-alone Broadband bi-directional & multi-channel two-way radio signal suitable to drive its internal high-power amplifiers that feed the service-side transmit signals and/or a fiber-optic distribution.

The system houses multi-carrier linear broadband power amplifiers and automatic level control. The amplifiers are designed with special linear characteristics for continuous operation, 100% duty cycle 24 hours/7 days a week. Its modular construction allows easy access to the amplifier modules and power supply.

It has a maximum gain around 60 dB across the band. The output power amplifier P1dB Compression point is around 20 Watts (+43 dBm). They also have an automatic gain control range greater than 25 dB.

The amplifiers modules are bolted down onto a heat-sink base. These heat sinks have adequate capacity to dissipate five times the maximum anticipated heat being generated by the amplifiers. It is recommended the temperature of the room be maintained below 80° F to assure the longest possible life of the amplifier transistors. The power supply has +28 VDC module for the amplifiers, equipped with over current and over voltage protection among other features. It will immediately drop the supply voltage to prevent damage to other components.

The unit's operational parameters are stored in the non-volatile memory of the embedded controller; this allows the booster to operate on a standalone basis. The built-in Web Server provides a Graphical User Interface (GUI) to ease in remote monitoring & control. Access is obtained via a PC's Web Browser and a TCP/IP connection to the Unit. The system can be connected directly to a PC computer or can be plugged into the local area network.

Discrete Digital I/O alarms are available for external monitoring.

## D.2 FUNCTIONAL BLOCK DIAGRAM

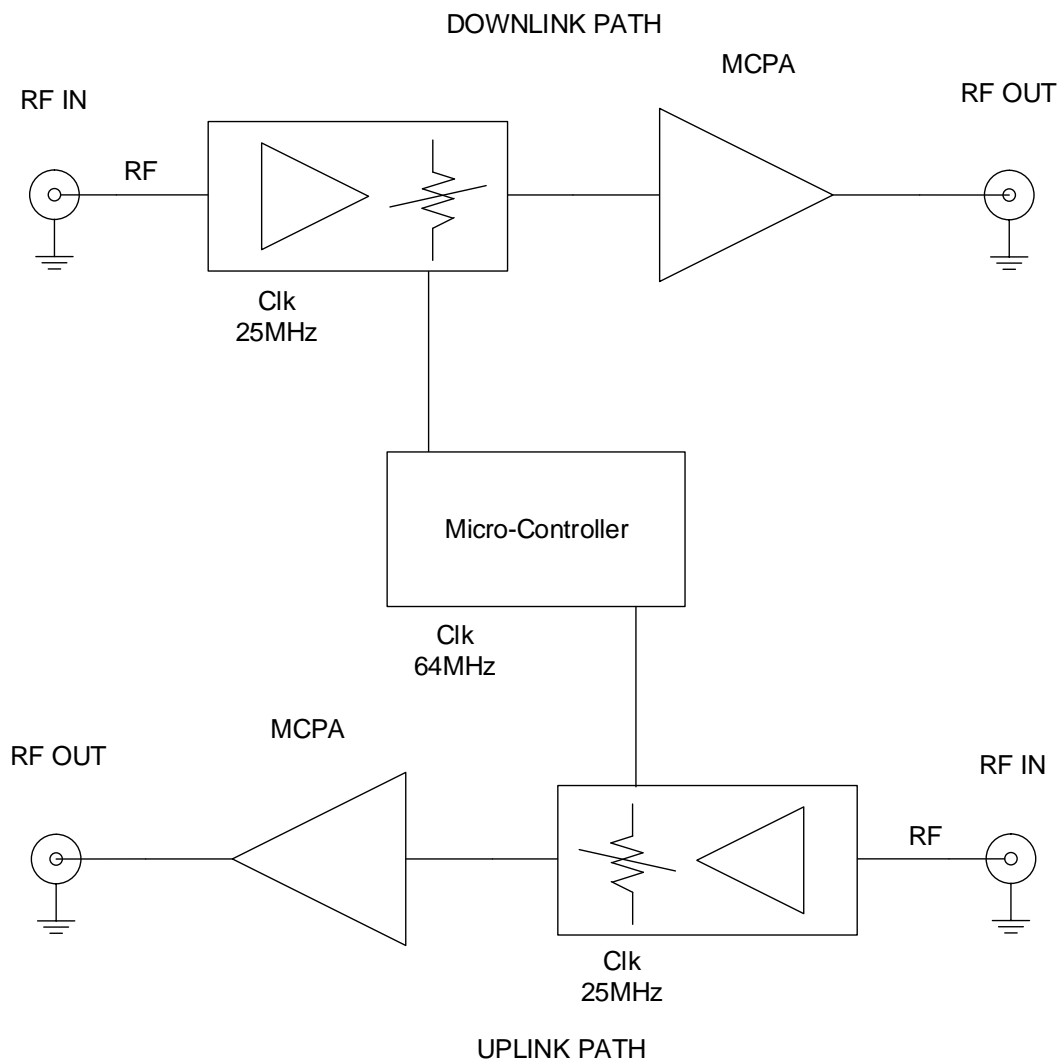


Figure 1 – M4BBDAV General Block Diagram

## D.3 FEATURES

- Two-way Radio Broadband Bi-Directional Amplifier system
- >10 W output compression point (P1dB) highly linear multi-carrier power amplifier (MCPA) with 55 dBm OIP3 delivers very low in-band Intermodulation products, plenty of head-room for the multi-carriers peak envelope power.
- Integrated high-power amplifiers (MCPA).
- Embedded microcontroller for control and self-monitoring functions.
- Remote control via web-server and SNMPv2 industry standard protocol.
- Discrete Digital I/O alarm signals available,
- Opto-coupler inputs and relay contact outputs
  - Opto-coupler inputs and relay contact outputs
- AC powered.

## D.4 SPECIFICATIONS

Parameters (Downlink & Uplink)	Typical Specifications
<b>Electrical</b>	
Available Operating Frequency Bands	Custom build sub-bands between 150-174 MHz
General Duplexer specs:	One window per path (DL & UL), non-interleaved channel frequencies, minimum 3 MHz separation between DL & UL frequency band edges, to be specified upon order.
Downlink Output Power 1dB Compression (P1dB CW)	20 Watt (standard) or 5 Watt. Low Power option available (+17 dBm for service fiber DAS)
Downlink Third Order Intercept Point (OIP3), cascaded system after custom BPF loss. * Two-tone test, 2W each * 25kHz-1MHz spacing NOTE: MCPA module OIP3 is +53 dBm (20Watt option)	> +50 dBm
Maximum Recommended Downlink Operating Power Levels, 10 dB back-off from P1dB (20W).	2 carriers: +30 dBm each; 4 carrier: +27 dBm each 8 carrier: +24 dBm each; 16 carrier: +21 dBm each
Downlink Maximum Gain (net)	60 dB
Downlink maximum input level for normal operation	-20 dBm
Downlink Noise Figure (at system level including custom BPF loss)	<6 dB
Uplink Output Power 1dB Compression (P1dB CW) options	20 Watt (standard) or 5 Watt. Low Power option available (+17 dBm for service fiber DAS)
Uplink Maximum Operating Output Power Setting	0 dBm (to feed fiber transmitter)
Uplink Maximum Gain (net)	60 dB
Uplink Maximum input level for normal operation	-20 dBm
Uplink Noise Figure (at system level including custom BPF loss), for low level signal outside of OLC range. Note: active stages NF is 2 dB typ.	<6 dB
Downlink and Uplink RF Input Limit Control (iALC) range Activation of the ILC does not create inter-modulation products or spurious outputs with levels greater than -60 dBc over the entire range of operation of the ILC, for any frequency spacing including down to 25 kHz. It prevents internal saturation of the amplifier stages	> 25 dB (30 dB typ)
Gain Control range (UL & DL)	>25 dB (30 dB typ), 1dB digital step
System Signal Gain Flatness (UL & DL)	±1.5 dB
System Input/Output Interface (UL & DL)	50 Ohm, coaxial Type-N; VSWR 1.5:1 typ





<b>Control Interfaces</b>	
Local Human-Machine-Interface	LCD display with 7-button keypad LED Indicators
Computer Network Interface (RJ45 Ethernet 10/100)	Embedded Web-server and SNMPv2 support over TCP/IP
Serial Port	USB (factory debug)
Factory-Programmable-function Discrete Digital I/O (Dry contact, voltage-free)	4 Relay output contacts 4 Opto-isolated inputs
<b>Mechanical &amp; Environmental</b>	
Wall-mount enclosure Painted or Stainless-steel NEMA-4X (option)	Actual Size depends on Frequency Plan
Rack-mount	19 inches depth Height depends on actual frequency plan
Operating ambient temperature range	-20 to + 60° Celsius, 100% duty cycle
Cooling	Natural Convection (wallmount) Forced ventilation (rackmount)
MTBF	> 100,000 hours > 70,000 hours (fiber-fed versions)
Power Requirements	400W, 100-240 Vac 50/60Hz
Internal Built-in Sensors	DC Voltage(s), DC Current(s), Composite Forward RF output power, Composite Reverse RF power, ALC level
<b>Optional Optical Interface over Single-mode fiber (optional)</b>	
Laser Optical Output Power	4 mW
Operating Wavelength	1310 nm
Frequency Response (380-512 MHz )	± 1.5 dB
Input/Output Impedance	50 Ohm
Input/Output VSWR (50-2500 MHz)	1.5:1
RF Link Gain	0 dB
Input Noise Floor	-137 dBm/Hz
Input Third Order Intercept	+30 dBm
<b>Custom Build Options</b>	
Duplexer for common Tx/Rx antennas, or completely separate DL and UL paths. 50-Ohm Coaxial Type-N	
Fiber-fed, integrated very low noise RF/Optic transceivers	





Multi Carrier Power Amplifiers (MCPA) on donor and service interfaces are optional per system requirements

NFPA72-2010 compliant or Custom Input/Output status/monitoring functionality, for example: Open door, Low-Battery, AC Power Failure, Smoke detector, Strobe light or Siren indicator, etc.

Sensors DC Voltage Buffered Outputs 0-5V for external SCADA monitoring: MCPA DC Voltage/Current, Composite RF Output power, Temperature, RF output, ALC monitor, or others upon custom demand.

## D.5 FRONT AND REAR PANEL PORTS AND INTERFACES

Figure 2 shows the system front panel. A brief explanation is given in Table 1.

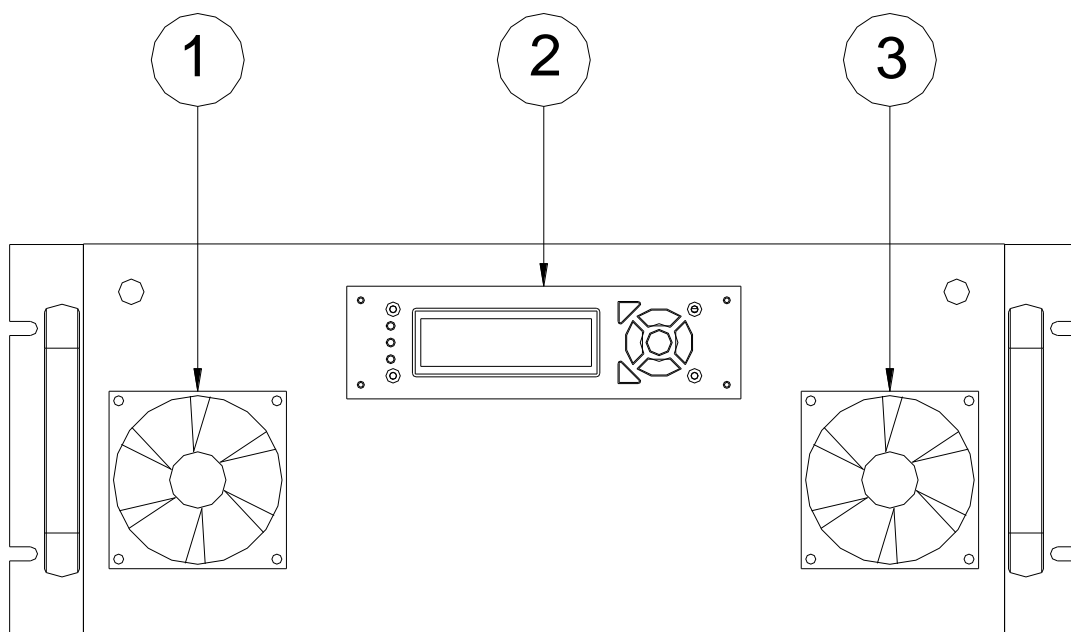
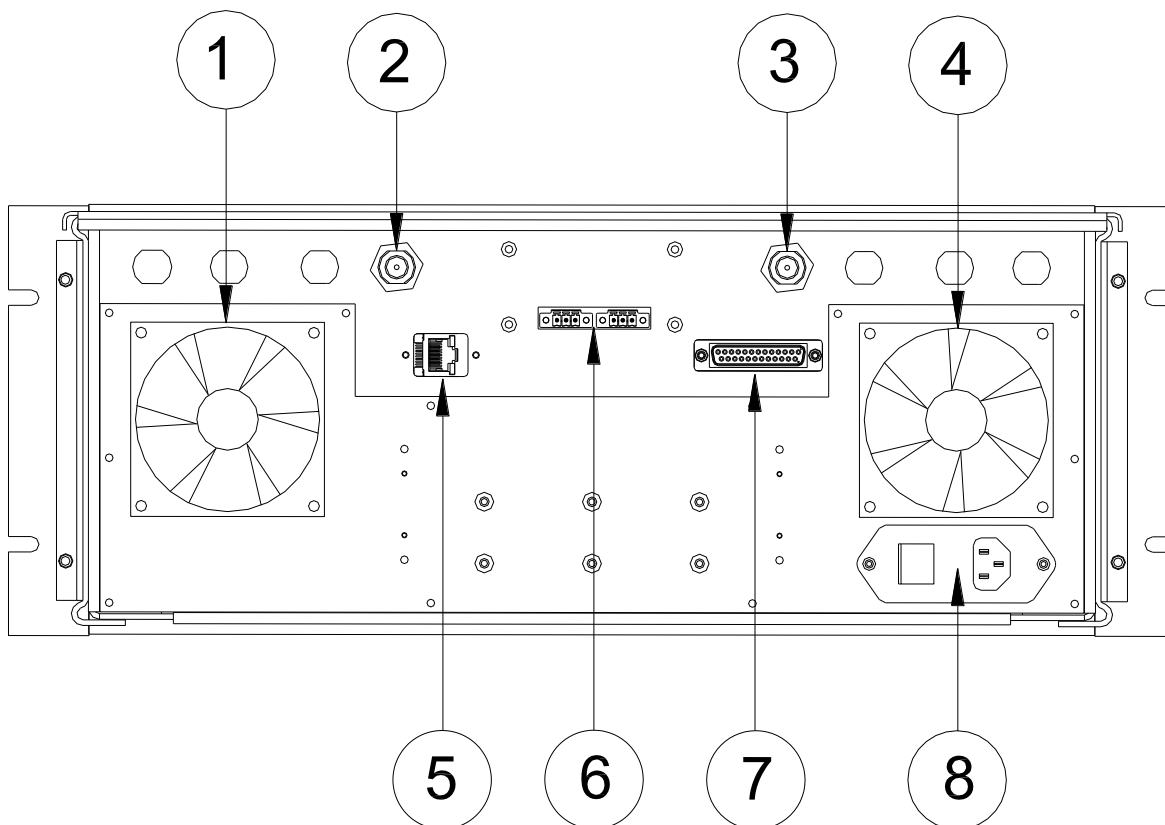


Figure 2 - Front Panel details

Table 1 – Front Panel details

Item	Description
1	AIR INTAKE FAN 1
2	LCD DISPLAY/KEYPAD
3	AIR INTAKE FAN 2

Figure 3 shows the system rear panel. A brief explanation of each connector is given in Table 2.



**Figure 3 - Rear Panel details.**

**Table 2 – Rear Panel details.**

Item	Description
1	AIR EXHAUST FAN 1
2	RF IN PORT
3	RF OUT PORT
4	AIR EXHAUST FAN 2
5	ETHERNET 10/100 NETWORK PORT
6	EXHAUST FANS HEADER RECEPTACLES
7	DB-25 I/O CONNECTOR
8	AC POWER "IEC" INLET
13	AC MAINS ON/OFF POWER SWITCH

## D.6 LCD-DISPLAY & KEYPAD ASSEMBLY

The LCD Display/keypad assembly allows the user/technician to read the system's meters, alarm status signals and system information.



**Figure 4 – LCD and Keypad Interface**

Up and Down arrow are used to scroll up and down in the given menus, while the round button in the middle are used to select a desired option in the menus.

The information shown by the light indicators is factory configurable. The Function 1, Function 2 and the Right arrow buttons are not used in the model described in this document.

The Indicator LEDs show the alarm status as below:

- L1: Summary Alarm
- L2: UL Subsystem Alarm (if applicable)
- L3: DL Subsystem Alarm (if applicable)

If the user wishes to go back to the main menu, use the Left arrow Key. It is possible to press the Left arrow or the select keys at any time, to jump directly to the desired menu.

**Table 3 – Alarm available at the Front Panel LCD**

<b>Parameter</b>	<b>Possible values</b>	<b>Remarks</b>
Summary Alarm	OK /BAD	Master Summary Alarm
SubSystem UL	OK /BAD	UL SubSystem Status
SubSystem DL	OK /BAD	DL SubSystem Status
Fan Alarm	OK /BAD/ON/OFF	Fans Status
UL FWD Alarm	"N/A"/OK/BAD	UL MCPA Forward Power Alarm
UL REF Alarm	LAT/"N/A"/OK/BAD	UL MCPA Reflected Power Alarm
DL FWD Alarm	"N/A"/OK/BAD	DL MCPA Forward Power Alarm
DL REF Alarm	LAT/"N/A"/OK/BAD	DL MCPA Reflected Power Alarm
I PA UL	OK /BAD	UL MCPA DC current within expected range
I PA DL	OK /BAD	DL MCPA DC current within expected range
I PSU 5V	OK /BAD	PSU 5V DC current within expected range
I PSU 12V	OK /BAD	PSU 12V DC current within expected range
8DL TEMPERATURE	OK /BAD	UL MCPA temperature within expected range
AIC UL Status	OK /BAD	UL Analog Interface Module Status
AIC DL Status	OK /BAD	DL Analog Interface Module Status
IALC ATT UL	OK /BAD	UL Analog Interface Module Attenuation Status
IALC ATT DL	OK /BAD	DL Analog Interface Module Attenuation Status
Fan 1	OK / BAD	Front Panel Fan summary alarm
Fan 2	OK / BAD	Rear Panel Fan summary alarm
Fan 3	OK / BAD	Front Panel Fan summary alarm
Fan 4	OK / BAD	Rear Panel Fan summary alarm

### Possible values for Alarms

**OK** There is not alarm condition.

**BAD** There is an alarm condition.

**LAT** Applies only for High Reflected Power Alarm when a previous alarm has not been cleared.

**N/A** Applies only for High Reflected Power Alarm and Forward Power Alarm. It will be displayed when is not possible determinate the alarm status due the read power is lower than minimum readable.

**Table 4 – Meters available at the Front Panel LCD**

<b>Parameters</b>	<b>Possible values</b>	<b>Remarks</b>	<b>Units</b>
UL FWD <sup>(1)</sup>	---	UL Output Forward RF power (Composite)	dBm
UL REF <sup>(1)</sup>	---	UL Output Reflected RF power (Composite)	dBm
DL FWD <sup>(1)</sup>	---	DL Output Forward RF power (Composite)	dBm
DL REF <sup>(1)</sup>	---	DL Output Reflected RF power (Composite)	dBm
I PA UL	---	UL MCPA current drain	A
I PA DL	---	DL MCPA current drain	A
I PSU 5V	---	5V DC current drain	A
I PSU 12V	---	12V DC current drain	A
I ALC UL	---	UL Analog Interface current drain	A
I ALC DL	---	DL Analog Interface current drain	A
Temp UL	---	UL MCPA Temperature	°C
Temp DL	---	DL MCPA Temperature	°C
iATT UL	---	UL Fixed Input Attenuation	dB
iATT DL	---	DL Fixed Input Attenuation	dB

**Table 5 – Network Settings available at the Front Panel LCD**

<b>Parameters</b>	<b>Possible values</b>	<b>Remarks</b>
Model Name	---	System Model Name
Serial Number	---	System Serial Number
Filter Model	---	Depends on firmware
IP Address	---	System IP ADDRESS
Subnet Mask	---	System Subnet Mask
Default Gateway	---	System Default Gateway

Notes:

<sup>1</sup> These values can appear as "< ##.##", when the read power is lower than minimum readable.



## Section E. INITIAL CONFIGURATION



Canam Technology's Equipment is factory configured. All setup and wiring is performed by Canam's Personnel. There is no need to disconnect the equipment unless the units should be serviced.



If any module should be disconnected, it should only be done by qualified technical personnel.

The unit operates stand-alone and only requires initial configuration, by means of the Web Server Interface (over its LAN Ethernet interface).

The following guidelines provide information on how to get started with the unit.

- Make sure the power switch is **OFF**, and plug the AC power cord into the IEC inlet receptacle.
- Provide a connection from the off-air antenna interface to Antenna Rx Input.
- Provide a connection from the in-tunnel (in-building) antenna point-of-interface to the DONOR/BASE T/R PORT and SERVICE/SIDE T/R PORT.
- The dry-contact alarms are available on a pluggable mini-terminal block on the shelf's rear panel DB-25 connector.
- Additional I/O signals are available on a 6-contacts pluggable terminal block.
- The technician's computer shall be networked with the device, by means of an Ethernet switch/hub or a direct PC-to-device connection using a crossover cable. The computer shall have a Mozilla's Firefox web-browser software installed, or similar.



- Provide a network connection to the system, directly into the ECM LAN port.
  - Use an Ethernet crossover cable for direct connection to a PC computer LAN port.
  - Use a standard straight-thru cord when using a network switch/hub connection

Once the physical connection has been established, power-on the device. Wait a 2 minutes period for the embedded management software to load-up.

After the load up is completed, the device's LCD display will look like this once:

→ View alarms  
View meters  
Network Info

Now the device is ready for management functions using the web-browser on the PC computer.

## **E.1 GENERAL GUIDELINES REGARDING RF CONNECTIONS & OPERATIONS WITH TEST INSTRUMENTS**

- ✓ Mute the MCPA prior to connect a signal source to the RF IN PORT.
- ✓ Avoid excessive input power.
  - Do not drive the input signal above -20 dBm, which is the recommended maximum input level (composite).
- ✓ Make sure your RF Test Instrument (Communications Monitor, Spectrum Analyzer, etc) has an input port rated for high RF power.
  - Do not exceed the test-instrument's input rating.

## **E.2 ANTENNA INSTALLATION**



The corresponding antennas are not included with this equipment. Nevertheless, if this device is used in an application that requires direct connection to an antenna, Canam Technology recommends following the FCC guidelines for its installation:

- Antenna Installation should be performed by qualified technical personnel.
- The installations instructions are for the purpose of complying with FCC RF Exposure and are not optional.
- All antennas should be fixed mounted and physically secured to one location.
- Non-building mounted antennas must be greater than 10 meters above ground.
- Minimum Separation to any body part of any person is 25cm.

## Section F. WEB-SERVER GRAPHICAL USER INTERFACE

### F.1 FIRST-TIME START CONFIGURATION

The system can be connected directly to PC computer using an Ethernet crossover cable or to LAN using a standard straight-thru cord when using a network switch/hub connection.

Section F.1.1 shows how to interface a computer directly to the system using a cross-over cable in case there is no network switch available.

Section F.1.2 shows how to interface the computer to the RF device by means of a network Ethernet switch.



Before to access system built-in Web Server verify your web browser is working with java script enabled.

These are some web links showing HOW-TO enable java script.

<https://support.microsoft.com/en-us/gp/howtoscript>

#### F.1.1 CONNECTING SYSTEM DIRECTLY TO PC COMPUTER

Use an Ethernet crossover CAT5 cable for direct connection to a PC computer LAN port.

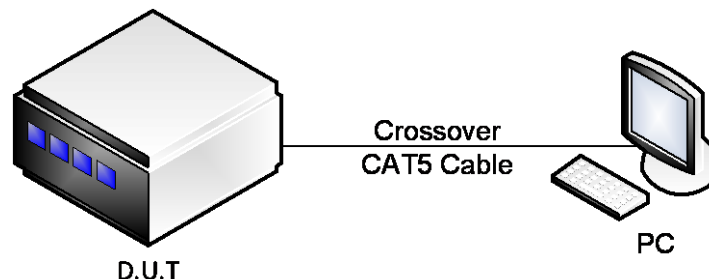


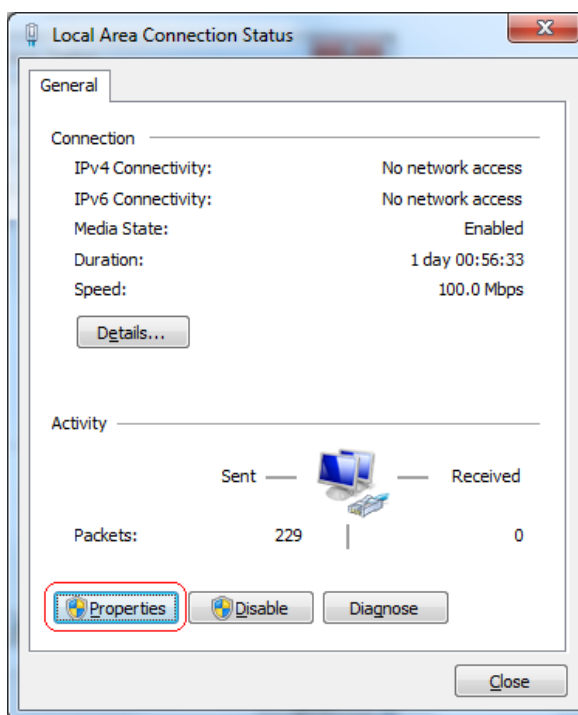
Figure 5 – System connected directly to PC computer.

- Connect the system to PC computer directly into the ECM LAN port.
- The equipment IP address and Network Mask (255.255.255.0) are shown in the LCD display.

- To verify IP address press the Down key in LCD Display and Keypad assembly until get IP ADDRESS and SUBNET MASK values.
- Configure the local computer IP address and Network Mask to allow access to the controller, within the same sub-net.

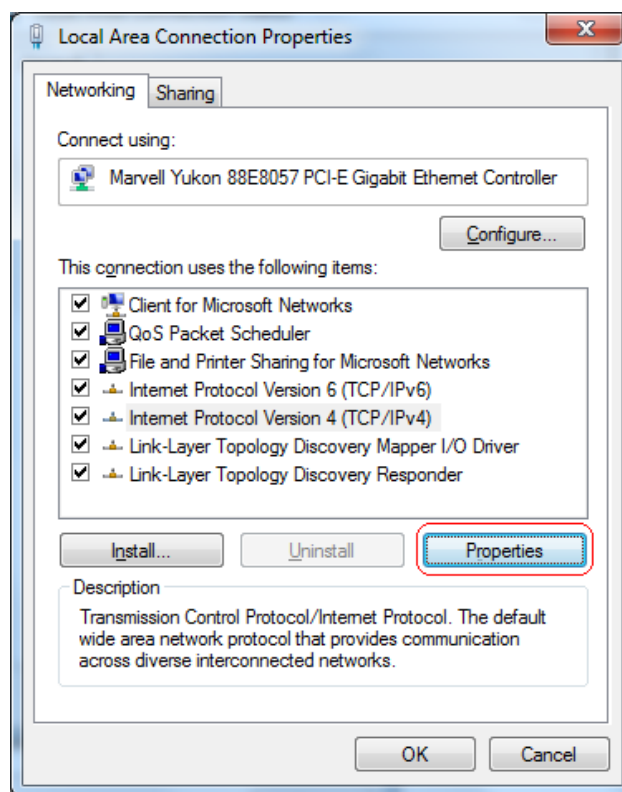
### Windows 7

1. Go to **“Start >> Control Panel >>Network and Internet”**.
2. Left-click on **“View network status and tasks”**.
3. In **“Network and Sharing Center”**, right click on **“Local Area Connection”** and go to **“Properties”**.



**Figure 6 – Local Area Connection Status.**

4. Look for **“Internet Protocol Version 4 (TCP/IPv4)”** and click **“Properties”**.



**Figure 7 – Local Area Connection Properties.**

5. Follows steps 4 and 5 as for Windows XP.
- Open a web browser and access the equipment by typing, in the address bar, the IP address of the equipment (ex.: <http://192.168.100.75>).
    - Login with username = operator, password = operator.

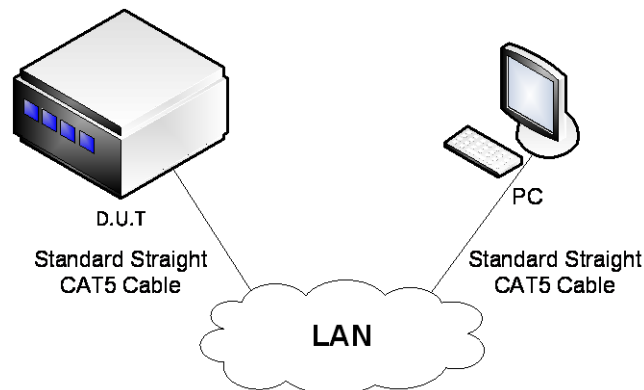
## F.1.2 CONNECTING SYSTEM TO LOCAL AREA NETWORK



Use standard straight-thru cable for network switch/hub connection.

To connect system to LAN, it is necessary to know the subnet the PC computer is currently plugged into.

If no network is available the user shall remain using the crossover interconnection



**Figure 8 – System connected into local area network.**

The following steps are necessary to connect system to LAN:

1. Connect the radio system and the computer together by means of ethernet switch.
2. The radio system has a default IP address (S.M. 255.255.255.0).
3. Configure the computer's IP address within the same subnet as the radio system, 192.168.100.X (for example 192.168.100.75, S.M = 255.255.255.0) as shown in previous section.
4. Open a web browser and access the equipment by typing, in the address bar, the IP address of the radio equipment.
5. Login with username = operator, password = operator



User may change the radio system's IP Address to a different subnet setting if desired.

1. First, it is necessary to connect system directly to PC Computer using the crossover cable.
2. Open a web browser and access the equipment by typing, in the address bar, the IP address of the equipment.
  - Login with username = technician, password = technician.
3. Go to the "Network Settings" page (see left-side menu) to change the current settings to be assigned by the network administrator.
  - IP Address, Network Mask, Gateway Address.
  - The controller requires a fix address; it does not allow DHCP settings.
  - Enter or press "Apply" button to apply the new parameters, and then restart the system.
  - Now the system controller can be plugged into the local area network served by your LAN Switch or Router.





## F.2 WEB SERVER OPERATIONS

The built-in Web Server provides a Graphical User Interface (GUI) to ease in remote monitoring & control. Some pages shown by the Web Server are the following:

- “Main Status”: depicts status alarm indicators and meters.
- “Main Settings”: is used to configure system-level macro settings

## F.2.1 MAIN STATUS PAGE

### Broadband BDA - Main Status

This page is autorefreshing every 5 seconds. The values being shown are a snapshot, that they may not represent the system status in real-time.

Autorefresh ☒ Enable ☐ Disable

Summary Alarm



Sub System UL



Sub System DL



#### Status Alarms Legend

Triggered

Normal/Enabled





Undetermined/Inactive











SNMP Agent

Enabled







#### MCPA's Meters And Status ?

	UL		DL	
	Meter	Status	Meter	Status
ALC Limiter Status	N/A	DISABLED	N/A	DISABLED
Amplifier Status	N/A	Unmuted	N/A	Unmuted
Output Power (dBm)	15	Normal	15	Normal
Reflected Power (dBm)	8	Normal	8	Normal
Current Drain Idc (A)	1.50		1.60	
Temperature (°C)	26		27	

#### Automatic Level Control Meters And Status

	UL		DL	
	Meter	Status	Meter	Status
Module Summary	N/A		N/A	
Comm Status	N/A		N/A	
RF Output (dBm)	<-45		<-45	
Current Drain Idc (mA)	711		447	

#### General Meters and Status

	Meter	Status		Status
PSU 5V Idc(A)	0.62		Fan 1	
PSU 12V Idc(A)	2.61		Fan 2	
			Fan 3	
			Fan 4	

#### Input Composite Power and iALC



	UL		DL	
	Meter	Status	Meter	Status
Input RF Composite Power(Multicarriers) (dBm)	<-45		<-45	
iALC Start Level (dBm)	-40		-40	
iALC Attenuation (dB) ?	0		0	

Figure 9 – Main Status page

This page shows meters and the different alarms as well as the iALC (input ALC). The auto-refresh radio-button allows periodic page updates every 10 seconds approximately.

### **Summary Alarm**

Master Summary alarm Indicator. Green if no single alarm is present in the system, red otherwise.

This alarm is mapped to ECM I/O DB25 Connector and can be access through pins; 14, 15 and 16. Also, it is shown as status indicators LED 1 and LED5 in ECM panel.

### **UL Subsystem**

Shows the UL subsystem current status.

Indicator is Green if UL iALC modules are active without alarms; red otherwise.

### **DL Subsystem**

Shows the DL subsystem current status.

Indicator is Green if 8DL & 7DL MCPA Reflected Power Alarm is cleared and iALC modules are active without alarms; red otherwise.

### **SNMP Agent**

Shows the SNMP Agent current status. Enabled subject to license.

## **MCPA's Meters and Status**

### **ALC Limiter Status**

The Output Automatic Level Control (MCPA ALC) limits the composite multi-carriers output power from exceeding the preset level. The indicator is ON when the MCPA is limiting; OFF otherwise. If the option is disabled in [Main Settings](#), the Limiter Status will show DISABLED.

### **Amplifier Status**

Indicates if the MCPA Output is "Unmuted", "Muted" or "Muted by Alarm" (in case the MCPA Reflected Power Alarm is "Triggered" or "Latched" and the option "Enable Automatic Mute upon Reflected Power Alarm" has been selected in [Main Settings](#) page).

### **Output Power (dBm)**

Composite Output Power.

The Status will be "Undetermined" when the power is not readable; "Normal" when it is above the threshold and "Triggered" if it is below the threshold.

### **Reflected Power (dBm)**

Composite Reflected Power.

The Status will be "Undetermined" when the power is not readable; "Normal" when it is below the threshold; "Triggered" if it is above the threshold and "Latched" when a previous Reflected Power Alarm has not been cleared.

### **Current Drain Idc (A)**

MCPA DC current drain.

The Status indicator will be green when the current is within the operating levels, red otherwise.

**Temperature (°C)**      MCPA heat-sink temperature.

The Status indicator will be green when the temperature is within the operating levels, red otherwise.

### **Automatic Level Control Meters and Status**

**Modules Summary**      Indicator is Green if module is active with no alarms, red otherwise.

**Comm Status**      Indicator is Green if Analog Interface Card communication is working, red otherwise.

**RF Output (dBm)**      Composite Output Power. This is the multi-carriers signal, used to drive the broadband output.

The Status indicator will be green if the power is above the threshold, gray otherwise (no traffic).

**Current Drain I<sub>dc</sub> (mA)**      Analog-Module DC Current Drain (mA).

The Status indicator will be green when the current is above the threshold, red otherwise.

### **General Meters and Status**

**PSU 5V I<sub>dc</sub> (A)/  
PSU 12V I<sub>dc</sub> (A)**      5Vdc/12Vdc current meter. Indicator is green if current is within the operating levels, red otherwise.

**Fan 1/Fan 2/Fan 3/Fan 4**      Indicator. Green if front fans are fully operational as detected by the air flow sensors; red otherwise.

Both of them are shown as a status indicator LED 8 in shelf rear panel.

## F.2.2 MAIN SETTINGS PAGE

### Broadband BDA - Main Settings

**iALC Control**

	UL	DL
Gain (dB)	60	60
iALC Set Point Level (dBm)	37	37
iALC Start Level (dBm)	-33	-33
Turn-off iALC stage	<input type="checkbox"/>	<input type="checkbox"/>

**MCPA's Control**

The following functions can be controlled either by hardware (external input) or by software, depending upon the following setting:

Control by

☐ Hardware
 ☒ Software

Output MCPA Mute

☐
☐

Reset reflected power alarm

	UL	DL
Output MCPA ALC Limit Level (dBm)	37	37
Output MCPA ALC Enable	<input type="checkbox"/>	<input type="checkbox"/>
Enable Automatic Mute upon Reflected Power Alarm	<input type="checkbox"/>	<input type="checkbox"/>
Enable Reflected Power Alarm Status Latch	<input type="checkbox"/>	<input type="checkbox"/>

**Figure 10 – Main Settings page**

The Main Settings page is for configuring general system-level macro settings.

### F.2.2.1 iALC Control

The Main Settings page is for configuring general system-level macro settings.

#### Gain (dB)

Maximum gain expected per path.

#### Set Point Level (dBm)

Desired output power to limit the input RF composite power when it is greater than iALC Start Level.



### Start Level (dBm)

The “Start Level” is a read-only value; it is automatically set by the system in order to comply with expected Gain and Set Point Level.

It is the input Automatic Level Control limiter threshold. If the Input RF Composite Power is greater than iALC Start Level, it will be attenuated to avoid system saturation.

### Turn-off iALC stage

Turn-off iALC stage output power causing the output power being down.

### F.2.2.2 MCPA Control:

For the “Output MCPA Mute” and “Reset Reflected Power Alarm Reset” commands, the user can set the preferred control method by choosing Software or Hardware in the “Control by” field.

#### Output MCPA Mute

Mute/un-mute MCPA

#### Reset Reflected Power Alarm

Clear the Reflected Power Alarm Latch.

- a. If the user chooses hardware control, the controller will respond to the opto-isolated inputs located in the ECM I/O DB25 Connector and the software commands for these two parameters will have no effect.

The Reset Reflected Power Alarm command mapped to ECM I/O DB25 Connector can be controlled through pins 7 and 8 for both Service Side (DL Tx) and Donor Base (UL Tx) outputs.

The Power Amplifier Mute command mapped to ECM I/O DB25 Connector can be controlled through pins 5 and 6 for both Service Side (DL Tx) and Donor Base (UL Tx) outputs.

When “Control by Hardware” is selected the UL and DL MCPAs are automatically un-muted unless the corresponding opto-isolated input is energized.

- b. On the other hand, if the user chooses software control, the controller will respond to these software commands instead of to the opto-isolated inputs.

Also, there are four M4-BBDA settings that can be controlled using software commands:

<b>Output MCPA ALC Limit Level</b>	Output limiter set point 30 to 37 dBm.
<b>Output MCPA ALC Enable</b>	Check-box to enable/disable the output ALC.
<b>Enable Automatic Mute upon Reflected Power Alarm</b>	Check-box to enable/disable automatic MCPA mute upon excessive reflected power.
<b>Enable Reflected Power Alarm Status Latch</b>	Check-box to enable/disable the alarm status latch.

### F.2.2.3 Updating operational settings

- Using the checkboxes click to check/un-check.
- Press enter or “Apply” button for the system to validate the data and apply changes.
  - If the value is not valid, an error message will be displayed (see Figure 11) and the new value will be not accepted keeping the previous value.
- The current state applied to system is saved to the controller's internal nonvolatile memory for effective recovery after a power loss or system reset.

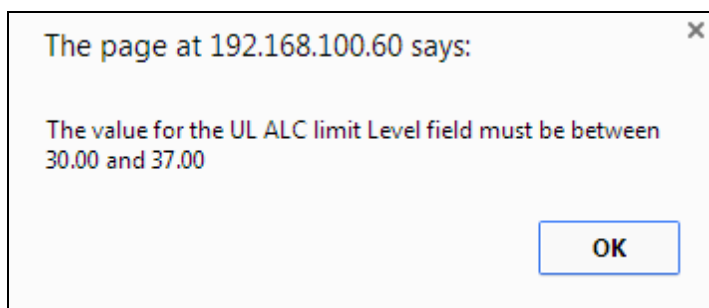


Figure 11 – Value is not into valid range error message



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